MIS20080 - GROUP PROJECT

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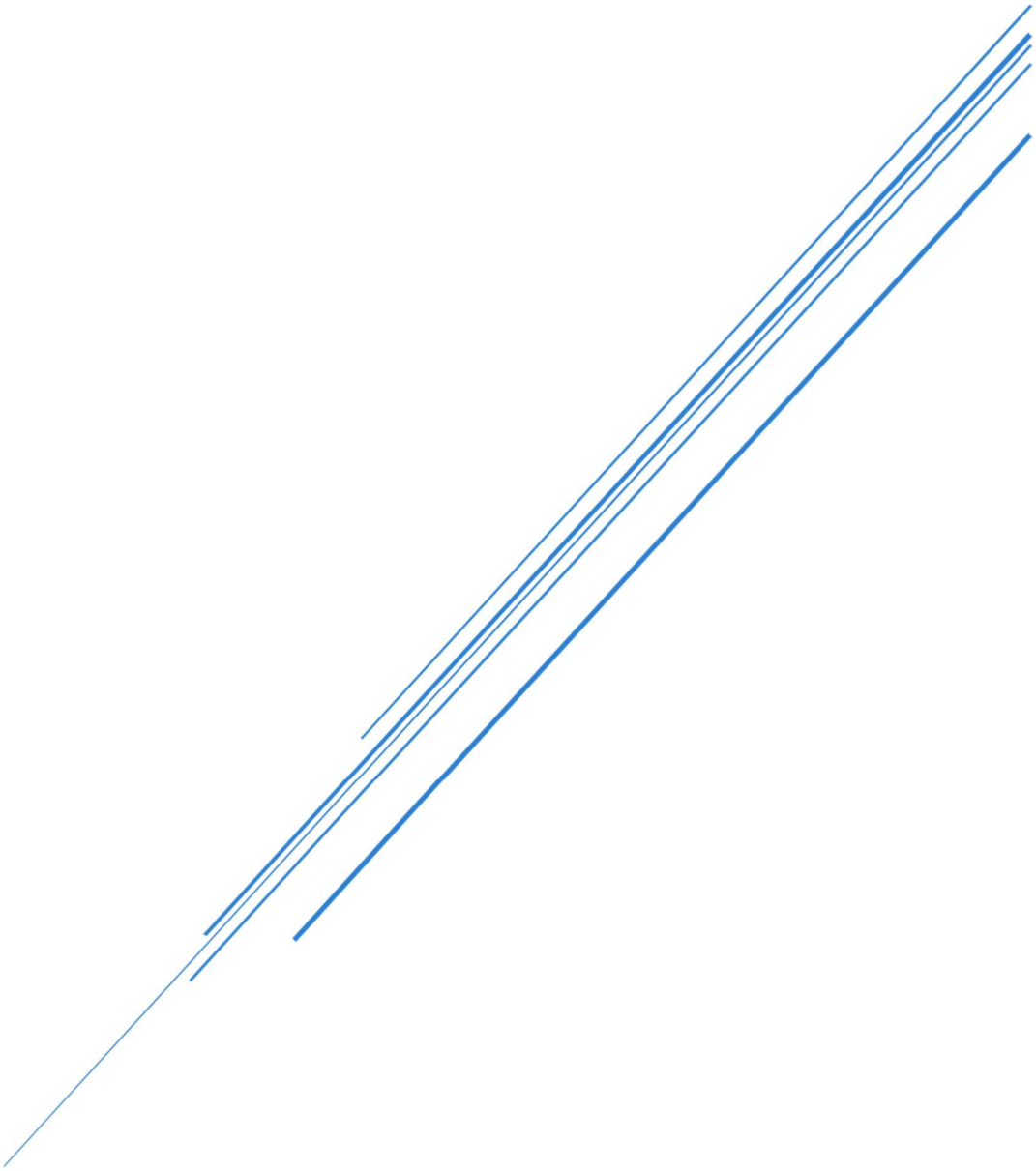


Introduction to Programming (MIS20080)

Cover Page, Contribution, AI Statement & Instruction Manual

Contribution Statement

Throughout the duration of the project each member of the group contributed evenly to the preparation of the final project.

AI Statement

AI (OpenAI, 2024, ChatGPT) was used in certain parts of this project. It was used to help with the CSS design through st.markdown(),as well as to identify errors in the and formatting graphs through the matplotlib, seaborn and mplfinance packages.

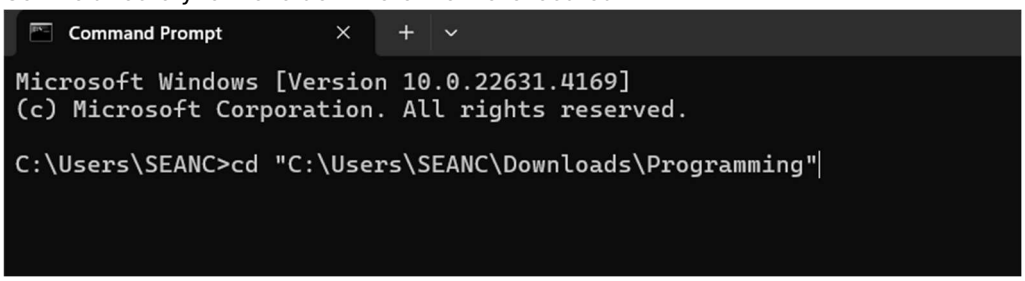
Brief Overview of Application

SMJR is an investments tool which allows users to assume the role of a portfolio manager and analyse their investment portfolio over time. Through the sidebar, users are able to input their initial investment, basket of stock tickers and their respective weights. Provided these steps have been taken correctly, the user then inputs the start date and end date of their portfolio. The website then contacts the yfinance API to fetch data and stores it to a pandas data frame. The website then analyses this pandas data frame and displays the portfolio's performance through a combination of statistical metrics and charts.

The website has three sections. The first deals with the overall portfolio and requires the user to input the initial investment of their portfolio, the tickers and their weights, and the date range for analysis. The second section analyses the weekly returns of the portfolio, and no user interaction is required. The third section analyses the recent performance of a selected stock, and a more nuanced perspective is displayed through the mplfinance package.

Steps for Installation and Requirements for Application

Download Python and an Integrated Development Environment, e.g., visual studio code (specify versions)
Set the directory to the folder where the file is located.

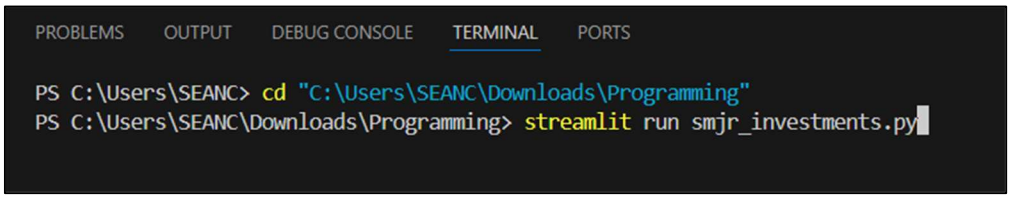


Example of directory change through the "cd" function in the command prompt

Download (through pip installation) the packages outlined in the requirements.txt file.
Ensure the CSV file comprised of Nasdaq tickers is downloaded and saved in same directory as file. This should be the case if the project file has been downloaded.
Please ensure all packages are installed with their correct versions before running. Refer to the requirements.txt file if unsure about the version of any package.

Users will need to run the following line of code in the through an appropriate terminal:

- `streamlit run smjr_investments.py`



Terminal example above is the command prompt

Once you run the previous line, the following will pop up:

This is the application.

Overall Portfolio Analysis

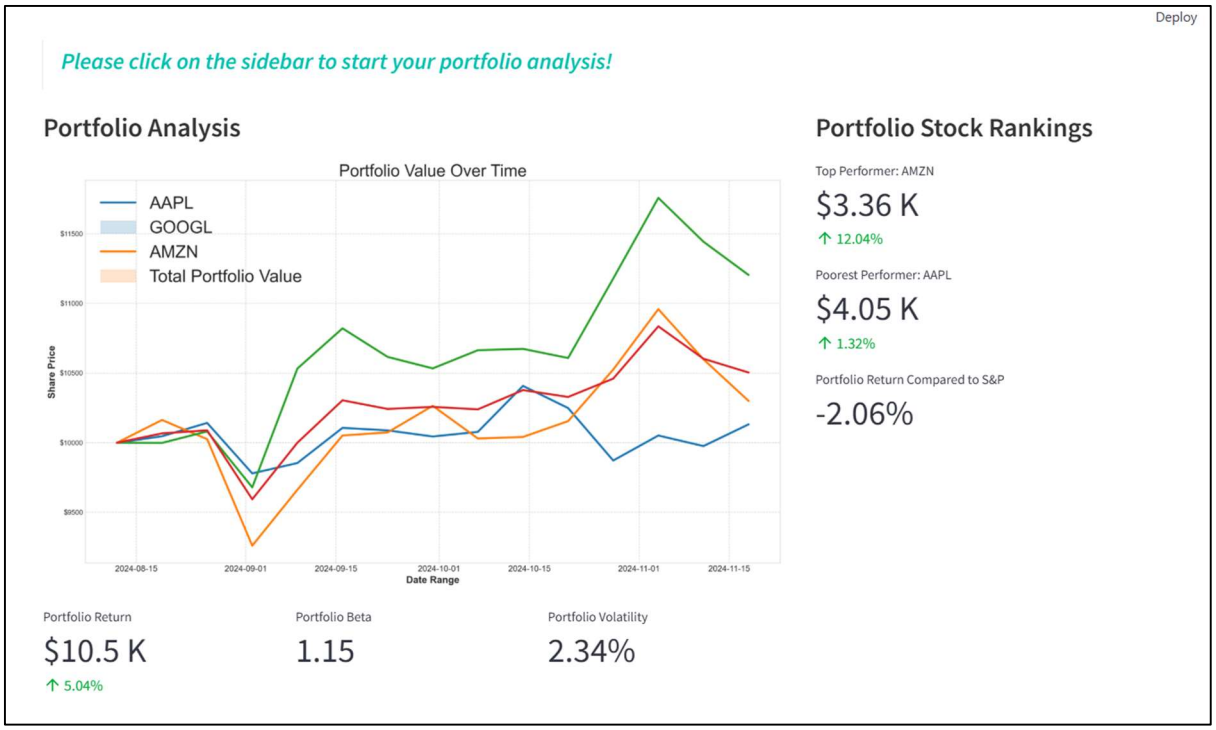
To begin click on the initial investment sidebar:

- Initial Investment:

- Input the amount you wish to invest in US Dollars. The input can only be numeric and non-negative. The maximum initial investment is $10 billion. Should any of these criteria not be met, users will be informed to adjust their input.
- Once you have inputted your initial investment select the number of stocks you wish to analyse. The input can only be a natural number. The application has a limit of fifteen stocks for analysis.
- Once all of the above conditions have been met, options will be displayed to enter each stock's ticker and the weighting they should bear in the portfolio.
- Please ensure the ticker is accurate. Refer to the ticker list provided in the attached CSV file, or the link the website provides to current NASDAQ stock tickers. The ticker can be inputted in either lowercase or uppercase. **IMPORTANT NOTE:** The program does not recognise the name of the company (this will cause an error message will appear).
- Users can then select the weight of each stock as a decimal. Inputs must be between 0 and 1 in order to be valid. Weights are automatically rounded to two decimal places. Intuitively, the weight sum has to be one. If not, an error message will be displayed.
- Users then select the date range of the portfolio. The end date by default is the current date, and the starting date is one hundred days before the current date. To allow enough data to be analysed, the minimum time range of the program is one hundred days.

Portfolio Value Graph and Metrics

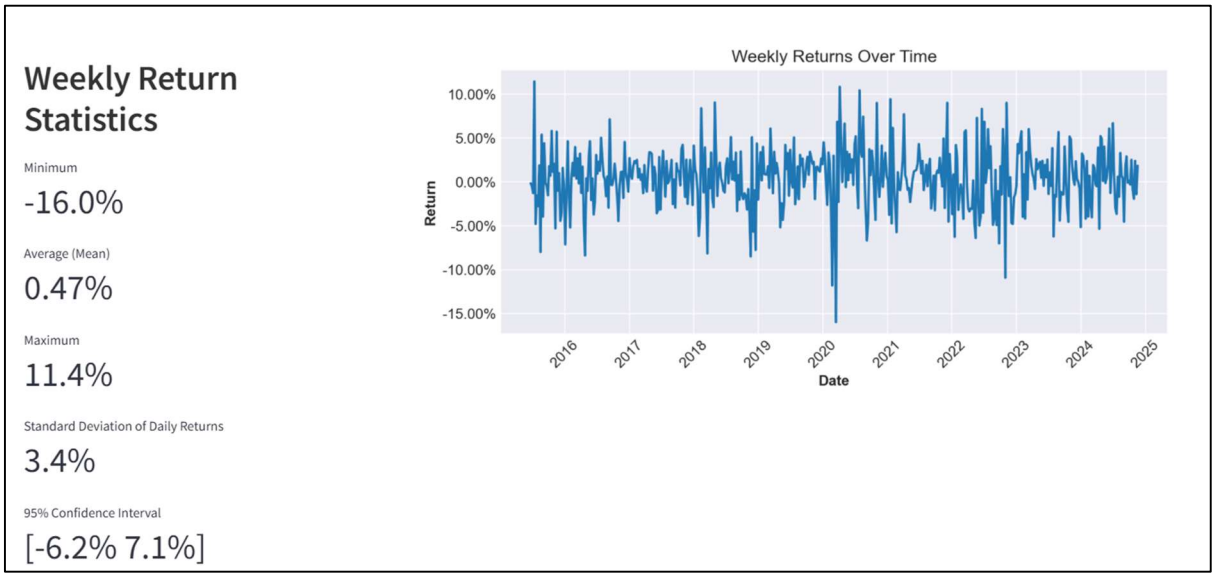
The portfolio's metrics are then displayed to the user. The best and worst performing stocks are displayed, alongside their returns. The overall portfolio value is displayed as well as its return to the S&P 500. The S&P 500 is a weighted basket of the largest stocks on US stock markets by market capitalisation. It is considered a proxy for the overall state of US markets and is what most portfolio managers compare their performance to.
Users are also able to check their portfolio's volatility (standard deviation) as well as the portfolio's beta. The beta represents the estimated change in a portfolio's value compared to the change in the return of a specified benchmark (S&P 500)
Sometimes data for the beta of a stock is unavailable. This normally occurs if the stock recently floated. In such an instance that the program is unable to find the beta for a specific stock, it will be unable to calculate the beta of the portfolio, and the user is informed of the stock's ticker.
Users have the option to tick a box to graph the portfolio's returns versus the returns of the individual stocks and/or the S&P500.



Visualisation of the Portfolio Analysis section

Weekly Return Statistics

The second section of the website analyses statistics obtained from the Portfolio Analysis. A time series graph of the weekly returns is displayed through the seaborn package alongside statistics. These include the minimum, maximum, mean, standard deviation and a 95% confidence interval of the returns. The return calculated is the arithmetic return. Only the total portfolio's returns are analysed in this section, and no user input is required.



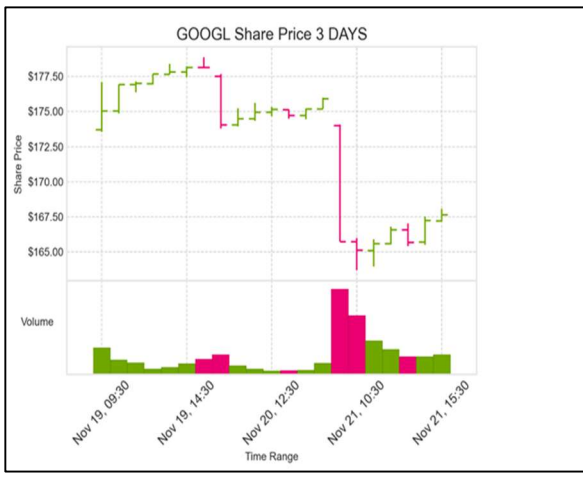
Weekly Returns Section

Individual Stock Analysis

The individual stock analysis, through the package mplfinance, is meant to give a nuanced interpretation of the recent performance of an individual stock from the portfolio. From the selection box the user can choose the ticker of the stock they wish to analyse. By default, this is the first stock entered. A list of options will show to adjust aspects of the graph. These include:

- **Style**: Sets the design of the graph, including the background colour, and colour of the aspect.
- **Type:**
  - **Candle**: If the real body is filled, the open price, indicated by the top of the real body, was higher than the closed, the bottom. A white real body indicates the opposite; the close was great than the open, and the open price is in line with the bottom of the real body and close the top of the real body. The top wick indicates the period's high, and bottom wick low.
  - **OHLC** (Open-High-Low-Close Chart) The top of the bar represents the period's high, bottom low, while the left stem represents the open and right close.
  - **Line** – Connection between different period's prices.

Examples of Types of Data Visualisation



OHLC example

Line Graph example

Candle Stick Example

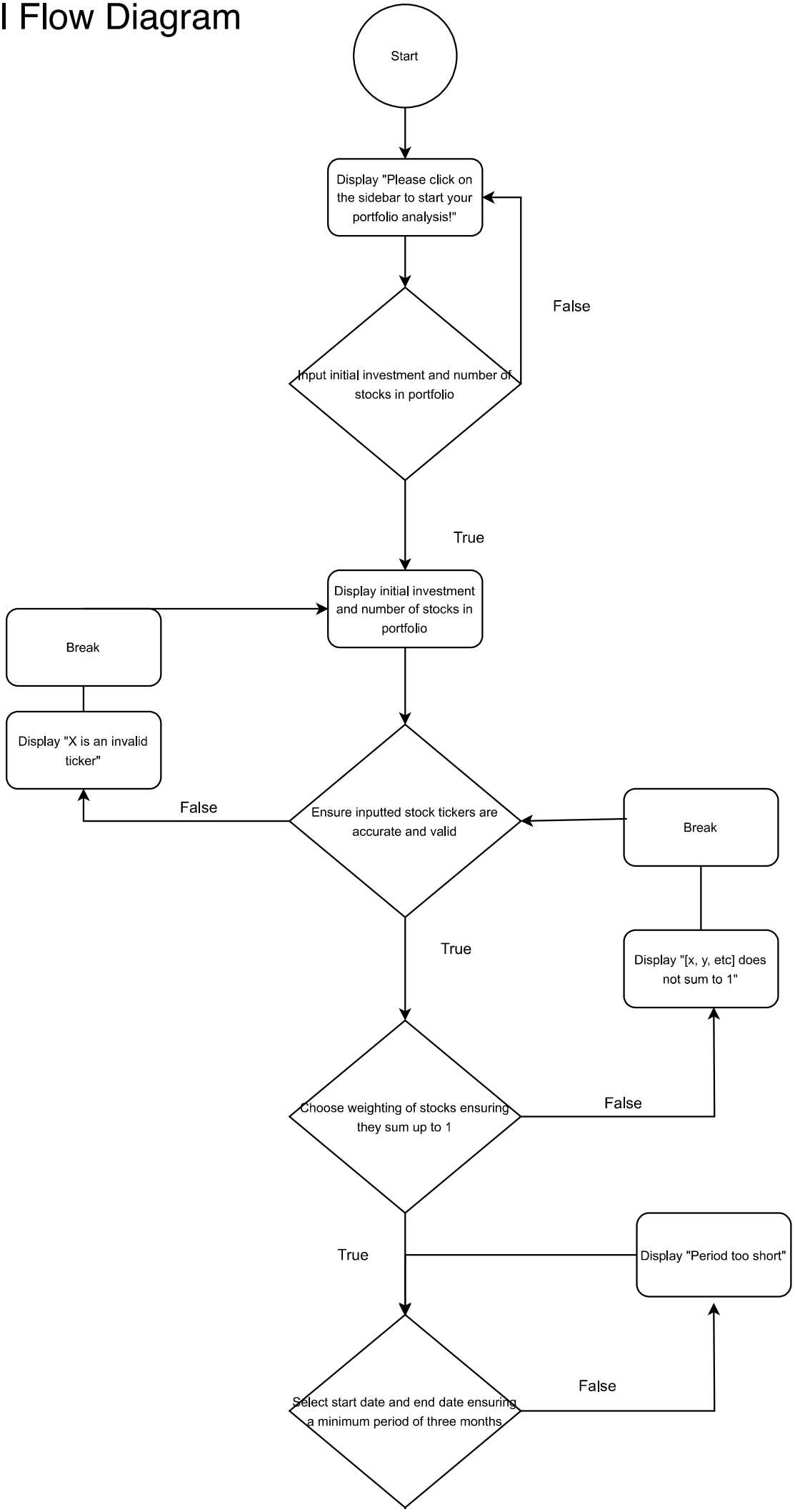
The first stock entered into the sidebar is the one that is displayed by default. The display type, graph type and period are binance, candle and 7 days by default. The volume traded during the period is displayed below each OHLC. The numeric tickers are not displayed, as investors are typically more interested in a comparison of volume traded rather than the exact number. **Please note** the time displayed is Eastern Standard Time (EST)**.** Should the time frame be set to the "Today" option, and the time of the request is before 09:30 EST (14:30 GMT), or on a non-trading day, the program will not be able to harvest data, and a prompt will appear informing the user that the request to yfinance was unsuccessful. In such an instance, a link will be displayed directing to the official NASDAQ website section on Holiday Days and Opening Hours.

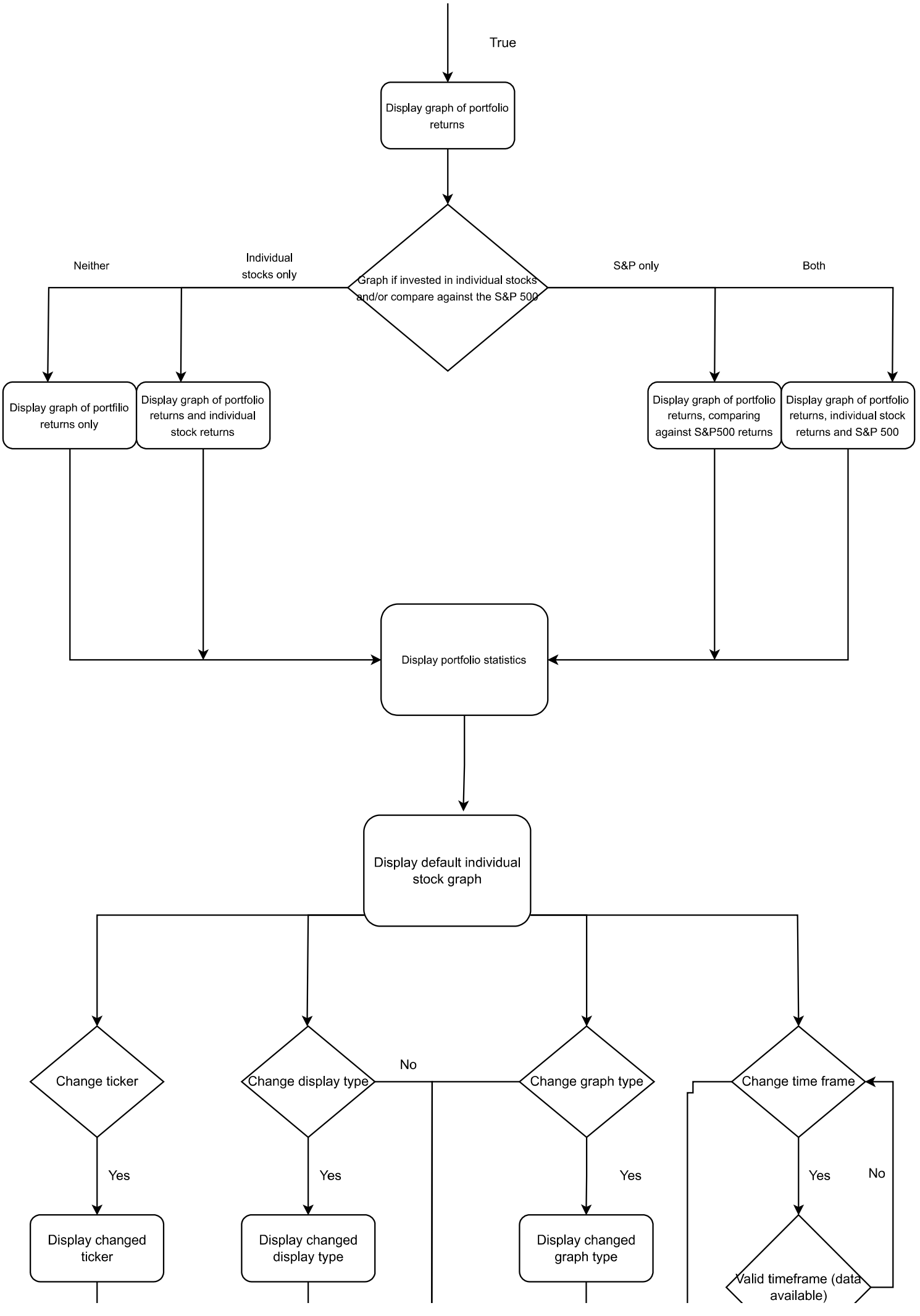
Non-trading days and times are not shown by the graph (i.e., there is no empty space on the graph for dates with no corresponding stock data)

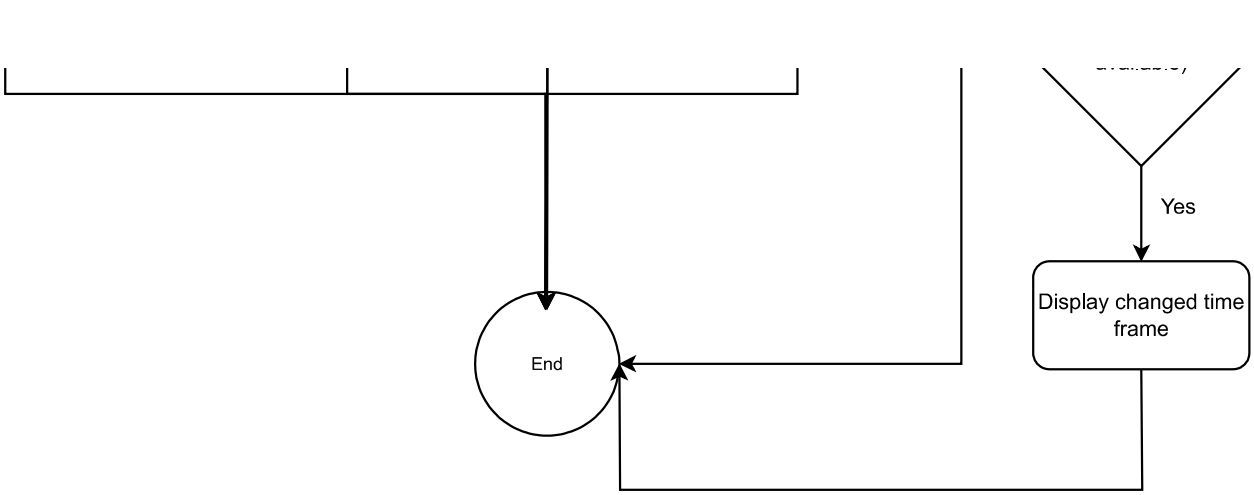
References

1. Slingacademy.com. (2024). *Using Pandas DataFrame.all() method (with examples) - Sling Academy*. [online] Available at: https://www.slingacademy.com/article/using-pandas-dataframe-all-method/#google_vignette [Accessed 22 Nov. 2024].
2. Al, baharak (2021). *how pull beta data from yahoo.finance?* [online] Stack Overflow. Available at: https://stackoverflow.com/questions/69352860/how-pull-beta-data-from-yahoo-finance. [Accessed 20 Nov. 2024]
3. Stack Overflow. (n.d.). *python - How do I get the row count of a Pandas DataFrame?* [online] Available at: https://stackoverflow.com/questions/15943769/how-do-i-get-the-row-count-of-a-pandas-dataframe. [Accessed 18 Nov. 2024]
4. Strimpel, J. (2011). *Portfolio Variance of a Portfolio of N Assets in Python*. [online] Stack Overflow. Available at: https://stackoverflow.com/questions/7409108/portfolio-variance-of-a-portfolio-of-n-assets-in-python. [Accessed 20 Nov. 2024]
5. Streamlit. (2024). *Building a dashboard in Python using Streamlit*. [online] Available at: https://blog.streamlit.io/crafting-a-dashboard-app-in-python-using-streamlit/. [Accessed 14 Nov. 2024]

Control Flow Diagram




True
Display graph of portfolio returns
Graph if invested in individual stocks and/or compare against the S&P 500
Neither
Individual stocks only
S&P only
Both
Display graph of portfilio returns only
Display graph of portfolio returns and individual stock returns
Display graph of portfolio returns, comparing against S&P500 returns
Display graph of portfolio returns, individual stock returns and S&P 500
Display portfolio statistics
Display default individual stock graph
Change ticker
Change display type
Change graph type
Change time frame
No
Yes
Yes
Yes
Yes
No
Display changed ticker
Display changed display type
Display changed graph type
Valid timeframe (data available)


Yes
Display changed time frame
End